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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/301,989 | 04/29/1999 | HERZEL LAOR | 4261500150 | 6316 |

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KILPATRICK STOCKTON LLP
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WASHINGTON, DC 20005

EXAMINER

BEHREND, HARVEY E

| ART UNIT | PAPER NUMBER |
|----------|--------------|
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3641

DATE MAILED: 05/08/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/301989

Applicant(s)

Laor

Examiner

Behrend

Group Art Unit

3641

—The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address—

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Status

- ☒ Responsive to communication(s) filed on 1/22/02
- ☒ This action is **FINAL**.
- ☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 1 1; 453 O.G. 213.

Disposition of Claims

- ☒ Claim(s) 59-67 is/are pending in the application.
- Of the above claim(s) _____ is/are withdrawn from consideration.
- ☐ Claim(s) _____ is/are allowed.
- ☒ Claim(s) 59-67 is/are rejected.
- ☐ Claim(s) _____ is/are objected to.
- ☐ Claim(s) _____ are subject to restriction or election requirement.

Application Papers

- ☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.
- ☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.
- ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
- ☐ The specification is objected to by the Examiner.
- ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119 (a)-(d)

- ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- ☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been received.
- ☐ received in Application No. (Series Code/Serial Number) _____.
- ☐ received in this national stage application from the International Bureau (PCT Rule 1 7.2(a)).

*Certified copies not received: _____

Attachment(s)

- ☒ Information Disclosure Statement(s), PTO-1449, Paper No(s) 21
- ☒ Notice of Reference(s) Cited, PTO-892
- ☐ Notice of Draftsperson's Patent Drawing Review, PTO-948
- ☐ Interview Summary, PTO-413
- ☐ Notice of Informal Patent Application, PTO-152
- ☐ Other _____

Office Action Summary

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1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. The specification is objected to under 35 U.S.C. §112, first paragraph, as failing to adequately teach how to make and/or use the invention i.e., failing to provide an enabling disclosure, for the reasons set forth in the 9/26/01 Office action (in sections 3-4 on pages 2-7 thereof), in the 2/21/01 Office action (in sections 5-9 on pages 3-7 thereof) and in the 7/5/00 Office action (in sections 6 and 9 on pages 3-6 thereof).

Applicants' arguments are unpersuasive.

As set forth in MPEP 2164-2164.08, the statute requires the applicant to teach how to make and/or use the invention.

As set forth in the above referenced sections of the previous Office actions, the examiner has set forth a reasonable basis for challenging the adequacy of the present disclosure. Applicant has not shown such to be in error.

As pointed out in said section 3 of the 9/26/01 Office section, the examiner had stated there is no enabling disclosure of how and in what manner, a Bose-Einstein condensate can be formed from atoms inside the reaction chamber (e.g. see the specification on page 4 lines 14+), nor, of how and in what manner, a Bose-Einstein condensate could be formed outside the reaction chamber, (such as in preparation chamber 124), and, as to how and in what manner it is caused to remain as a Bose-

Einstein condensate while it is being transported/delivered to its ultimate point of use (e.g. the point in the reaction chamber where it is irradiated with the laser beams) (i.e. the "providing" step of claims 59 and 62).

As pointed out for example in the Cornell et al, Scientific American article provided by applicant in the 11/14/01 IDS, and by Collins (Scientific American) the formation of a Bose-Einstein condensate requires the use of a magnetic trap along with laser trapping and cooling.

Assuming that the Bose-Einstein condensate is to be made (provided) inside applicants reaction chamber 104, there is no enabling disclosure of how and in what manner, said magnetic trap (or the apparatus for producing said magnetic trap) as well as the laser means used for the trapping and cooling, could be operatively incorporated into applicants reaction chamber 104 so as to show how to make and use applicants claimed invention as required by statute.

If the Bose-Einstein condensate is to be first made in preparation chamber 124 and than transported/delivered to a desired point within reaction chamber 104, there is no adequate description nor enabling disclosure of how and in what manner, said magnetic trap (or the apparatus for forming such) as well as the laser means for the trapping and cooling, can be transported/delivered from the preparation chamber 124 to the desired point in the reaction chamber 104, so as to be able to maintain the Bose-Einstein condensate as a condensate during transportation.

Applicants claims 59-61, 63 (and by inference, claims 64-67) require a Bose-Einstein condensate of helium-4 atoms.

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The examiner on page 4 of the 9/26/01 Office action referred to an article by Sid Perkins as indicating problems/difficulties in obtaining a Bose-Einstein condensate of helium.

Santos et al and Schewe et al show that a Bose-Einstein condensate of helium was finally obtained in 2001 (six years after the first Bose-Einstein condensate (of rubidium) was formed in 1995) (which is in itself considered evidence of undue experimentation).

More importantly, Santos et al and Schewe et al show that a Bose-Einstein condensate in helium was only obtained by using helium atoms in an excited state, an apparently critical feature not disclosed in the present specification. Applicants disclosure is hence insufficient in failing to disclose this apparently critical feature of the helium being in an excited state as well as the equipment/ procedures/ techniques/ etc., that was necessary to actually obtain said Bose-Einstein condensate of helium. Schewe et al and Santos et al are evidence that applicants disclosure was not enabling nor operative as of its filing date.

Schewe et al, state that one of the drawbacks, the price one pays for using atoms in an excited state, is that it is thus difficult to gather a large ensemble of atoms together into the condensate.

Note that Collins on page 95 describes Bose-Einstein condensates as "minuscule wisps of gas barely more substantial than a vacuum, held in place by magnetic fields for a scant few minutes at best".

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Combining the Schewe et al teachings with those of Collins means there will be even less He atoms present in the Bose-Einstein condensate and thus even less of a chance of nuclear fusion taking place!

According to the specification, the compression system 103 allows for the compression and/or de-condensing of the Bose-Einstein condensate to increase the chance of nuclear fusion.

Obviously, if the condensate is de-condensed, it is no longer a condensate, i.e. the condensate is destroyed.

There is accordingly no adequate description nor enabling disclosure of how and in what manner, one can meet the limitation in the last two lines of claim 59 or the last four lines of claim 62, since the condensate will be immediately de-condensed (destroyed) upon irradiation with the laser beam.

Since the condensate is de-condensed, it is not possible to have a "resulting ^8Be isotope" be co-located with a "He atom within the Bose-Einstein condensate and the disclosure is hence insufficient and non-enabling.

As a further example, note that the examiner on pages 3 and 4 of the 9/26/01 Office action, had stated that (1) "there is no adequate description nor enabling disclosure of how and in what manner it is determined that at least two of the atoms within the Bose-Einstein condensate are "co-located" as set forth in claim 59 and, that at least two atoms have "overlapping wave functions" as recited in claim 62" and, (2) "there is no adequate description nor enabling disclosure of how and in what manner, it is ensured that two of the ^4He will fuse to produce ^8Be , that the ^8Be will fuse with an ^4He

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to produce ^{12}C (nor as to how it is ensured that there will be an ^4He present or adjacent the ^8Be such that fusion will occur before the unstable ^8Be breaks up)."

As evidence that applicants disclosure is insufficient and non-enabling, the examiner had referenced two of applicants own publications submitted with the 7/17/01 response (the Fusion Technology article and the Laser Focus World article).

Likewise with an October 20, 1998 article by applicant entitled "Coulomb Potential Tunneling in the De-Condensing Process of Bose-Einstein Condensate" (hereinafter, Laor (III)), in which applicant on page 1 states " it is not certain that all atoms have fully overlapped wavefunctions, but we can assume that some of them overlap", and, on page 2 "It is suggested to irradiate a Bose-Einstein Condensate of light atoms with a femto-second laser pulse as an attempt to achieve fusion. It is hoped that upon de-condensing, a tunneling of the Coulomb potential will occur, enabling nuclear fusion. Detection of gamma ray emission could verify if any fusion occurred. Mass spectrometry of the resulting materials can also confirm any fusion." (Underlining added).

Such was also personally indicated by applicant to the examiner in the 7/12/01 interview in which Mr. Laor indicated that while he considered or believed that his invention would work in the manner indicated, actual experiments would be necessary to confirm his beliefs and to determine the actual system parameters necessary to cause nuclear fusion!

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Such is all considered evidence that even applicant does not consider his disclosure to adequately teach how to make and use the invention, i.e. to provide an enabling disclosure, nor, even that it is actually operative.

It is not seen wherein the 1/22/02 response discusses the applicants response to the examiner during the 7/10/01 interview nor the examiner's conclusions from applicants statements in his two articles submitted with the 7/17/01 response.

The failure to respond is taken as meaning that applicant considers the examiner's conclusions to be correct.

It is not clear what applicant means by the statement on page 13 of the 1/22/02 response: "Additionally, further guidance and support is found in the three (3) provisional applications cited within the first paragraph of this application". While applicant is claiming priority for all common subject matter, said three applications have not been incorporated by reference.

3. Claims 59-67 are rejected under 35 U.S.C. §112, first paragraph, for the reasons set forth in the objection to the specification, in section 2 above.

4. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

5. Claims 59-67 are rejected under 35 U.S.C 101 because the invention as disclosed is inoperative and therefore lacks utility, for the reasons set forth in the 2/21/01 Office action (see sections 14-19 on page 8-10 thereof) and in section 6 of the 9/26/01 Office action (see pages 7 and 8 thereof).

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Applicant argues that the invention has utility (is "useful") for the generation of energy and that this "use is repeated and highlighted throughout the specification" (page 13 of the 1/22/02 response).

While the claims themselves do not recite the generation of energy, the examiner agrees claims are to be read in light of the specification.

The claims refer to producing a nuclear fusion reaction. However, such a reaction by itself, is not sufficient to be "useful" in providing energy.

As stated for example in the specification on page 7 lines 25-30, fusing two ^4He atoms to produce unstable ^8Be will not produce energy because this is an endothermic process.

As also indicated on said page 7 lines 25-30, assuming one can actually fuse two ^4He atoms to produce unstable ^8Be , an additional ^4He atom must be immediately fused with the unstable ^8Be to produce ^{12}C (this being an exothermic reaction (gives off heat)).

However, for the invention to actually be "useful" in producing energy, there must be many reactions producing ^{12}C .

As set forth in detail above, there is no reputable evidence of record showing that one of ordinary skill in the art at the time of filing of the instant case, could even have been able to cause two ^4He atoms to fuse to produce ^8Be (a non-energy producing reaction) let alone, the subsequent fusion of this ^8Be with an additional ^4He to produce ^{12}C and energy.

As indicated by applicant in his specification (e.g. see page 7 lines 25-30 and page 9 lines 24-31), to cause the energy producing reaction $^4\text{He} + ^8\text{Be} \rightarrow ^{12}\text{C}$ requires

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the use of a laser with a pulse length of less than about one femtosecond (1×10^{-15} seconds). However, Bairstow (Laser Focus World, Jan. 1999) (referred to by applicant in his article in Laser Focus World, April 1997, page 67, cited in the 7/17/01 IDS) states that in 1999, femtosecond lasers in general (let alone one with a pulse length of less than about one femtosecond) would only be of use in a laboratory setting, because "they still require too much care and feeding to be useful in an industrial setting". It would require undue experimentation to overcome said "too much care and feeding" to be able to utilize said femtosecond laser with a pulse length of less than about one femtosecond for the useful production of energy as set forth in applicants specification.

Even applicant in his publications referred to in section 2 above, basically indicates that his invention is speculative, that it is no more than a concept and that experimentation is needed to see if it will actually work.

As indicated by applicant himself on page 67 of his article in Laser Focus World (April 1999), not even all of his research physicists' friends consider his invention operative re his statement:

"The idea is too create nuclear fusion by starting with Bose-Einstein condensate of light atoms. A femtosecond laser then will irradiate the condensate. As the atoms in the condensate are collocated, it is hoped that the nucleus of two atoms can decondense into the same physical location, practically tunneling the coulomb potential barrier... I am now looking for organizations that could do the experiment and see if the physical phenomenon actually happens. I have talked with several friends of mine who are research physicists (I am a physicist myself but my line of work is fiber optics), and most say that they can not see a reason why it will not work. But in such a case the only way to be sure is to test the idea and see. The cost of the test is very small compared to the possible benefits". (Underlining added).

In Brenner v. Manson, 148 USPQ689, the Court said:

"The basic *quid pro quo* contemplated by the Constitution and the Congress for granting a patent monopoly is the benefit derived by the public from an invention with substantial utility. Unless and until a process is refined and developed to this point – where specific benefit exists in currently available form – there is insufficient justification for permitting an applicant to engross what may prove to be a broad field."

...

"This is not to say that we mean to disparage the importance of contributions to the fund of scientific information short of the invention of something "useful", or that we are blind to the prospect that what now seems without "use" may tomorrow command the grateful attention of the public. But a patent is not a hunting license. It is not a reward for the search, but compensation for its successful conclusion. [A] patent system must be related to the world of commerce rather than to the realm of philosophy".

Applicants claimed process is not "useful" in the sense in which that term is used in 35 USC 101. *Brenner v. Manson supra*.

6. Claims 59-67 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

There is no support in the original disclosure for stating that the first isotope formed (i.e. the ^8Be) is "co-located" or has an "overlapping wave function" with a ^4He atom in the Bose-Einstein condensate.

It appears that applicant has combined the arguments against this rejection, with the arguments against the rejection under 35 USC 112 first paragraph in section 6 of the 9/26/01 Office action.

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It is not seen wherein the portions of the specification referred to in the arguments, recite or provide proper support for the language in question. For example, the specification on page 7 lines 25-30 does not state that the ^8Be atom and an ^4He atom are co-located in the Bose-Einstein condensate, as argued at the top of page 12 of the 1/22/02 response.

The specification (see for example page 9 line 19) states that the laser beam (which is allegedly utilized to cause fusion of two ^4He atoms), de-condenses the Bose-Einstein condensate.

If the Bose-Einstein condensate is de-condensed, said condensate no longer exists and, it is not possible for the ^8Be atom and an ^4He atom to be co-located in something which no longer exists.

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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8. Claims 62-67 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by any of Lo (US 4875213, hereinafter, Lo (I)), Lo (WO 93/11543, hereinafter, Lo (II)), Lo (WO 87/00681, hereinafter, Lo (III)), Lo (IV) (US 4926436) or Lo (V) (W 090/13130), for the reasons set forth in section 9 of the 9/26/01 Office action.

Applicants arguments are unpersuasive of any error.

Applicant argues that the references do not meet the limitations of claim 59. Such is irrelevant because claim 59 is not included in this rejection.

Applicant admits that each of the Lo references illustrate the forming of a Bose-Einstein condensate with a laser wherein the Bose-Einstein condensate has co-located atoms or, phrased another way, atoms with overlapping wave functions (e.g. see pages 16 and 17 of the 1/22/02 response).

Applicant instead, argues that none of the Lo references refer to the laser as "compressing" the atoms in the Bose-Einstein condensate.

The examiner disagrees.

It is an inherent property of a laser beam that it will apply pressure to (i.e. compress) whatever it irradiates (it is noted that applicant is aware of such because this light pressure is even referred to in the first column on page 22 of Mourou et al (Physics Today, Jan. 1998) submitted by applicant in the 11/19/01 IDS).

Thus, the laser beams in any of the Lo references will inherently apply pressure to (and hence serve to compress) the atoms in the Bose-Einstein condensate.

The Lo references also each refer to the use of He atoms and to obtaining nuclear fusion. Note particularly that Lo (V) on page 15 indicates that the He (alphas)

will combine to produce ^8Be . The Lo references utilize short laser pulses, e.g. see page 25 of Lo (V) (dated 11/90) which refers to a pulse length of less than 0.3 psec, and Lo (II) (dated 6/93) which on page 45 refers to an ultra short pulse length of the order of 10 femtoseconds.

Accordingly, it is considered that the references each disclose a manner of operation the same as is recited in applicants claims. Accordingly, this manner of operation of any of the references must also inherently function in the same manner to produce the same results.

As to limitations which are considered to be inherent in a reference, note the case law of In re Ludtke, 169 USPQ 563, In re Swinehart, 169 USPQ 226, In re Fitzgerald, 205 USPQ 594, In re Best, 195 USPQ 430, and In re Brown, 173 USPQ 685, 688.

9. Claims 59-67 are rejected under 35 U.S.C. 103(a) as being unpatentable over any of Lo (US 4875213, hereinafter, Lo (I)), Lo (WO 93/11543, hereinafter, Lo (II)), Lo (WO 87/00681, hereinafter, Lo (III)), Lo (IV) (US 4926436) or Lo (V) (W 090/13130) in view of any of Corkum, Schaffer, Olson, Laser Focus World or Optical Materials & Engineering News, for the reasons set forth in section 10 of the 9/26/01 Office action.

Note the discussion of applicants arguments concerning the primary references in section 8 above.

Applicant has not disputed that the secondary references show the advantageous use of femtosecond lasers of the type set forth in claim 59 nor that the

manner in which the examiner combined the teachings of the references is improper or in error.

Instead, applicant argues that the primary references do not teach laser compressing of the atoms of the Bose-Einstein condensate. This argument has been adequately addressed in section 8 above.

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

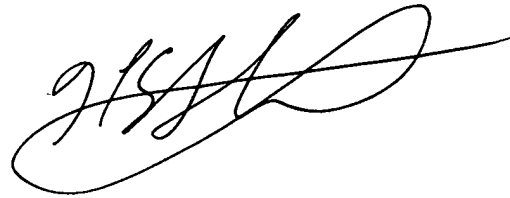
11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harvey Behrend whose telephone number is (703) 305-1831. The examiner can normally be reached on Tuesday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Carone, can be reached on (703) 306-4198. The fax phone number for the organization where this application or proceeding is assigned is (703) 306-4195.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 306-1113

Behrend/kn
April 30, 2003

A handwritten signature in black ink, appearing to read 'H. Behrend', with a large, sweeping flourish extending from the end of the signature.

**HARVEY E. BEHREND
PRIMARY EXAMINER**